Chapter B1: Summary of Compliance Costs

INTRODUCTION

This chapter presents the estimated costs to facilities of complying with the Final Section 316(b) Phase II Existing Facilities Rule. EPA developed unit costs of complying with the various requirements of the final rule, including costs of section 316(b) technologies, energy costs, and administrative costs. Unit costs were then assigned to the 554 in-scope facilities, based on the facilities' modeled compliance responses, and aggregated to the national level.

CHAPTER CONTENTS

B1-1 UNIT COSTS

Unit costs are estimated costs of certain activities or actions, expressed on a uniform basis (i.e., using the same units), that a facility may take to meet the regulatory requirements. Unit costs are developed to facilitate comparison of the costs of different actions. For this analysis, the unit basis is dollars per gallon per minute ($/gpm) of cooling water intake flow. All capital and operating and maintenance (O&M) costs were estimated in these units. These unit costs are the building blocks for developing costs at the facility and national levels.

EPA developed cost estimates for the final rule based on a variety of technologies for impingement mortality and entrainment reduction. Individual facilities will incur only a subset of the unit costs, depending on the extent to which their current technologies already comply with the requirements of that rule and on their projected compliance response. The unit costs used for the final rule analysis are engineering cost estimates, expressed in July 2002 dollars. More detail on the development of these unit costs is provided in the *Technical Development Document for the Final Section 316(b) Phase II Existing Facilities Rule*, hereafter referred to as the *"Phase II Technical Development Document*" (U.S. EPA, 2004b).

To characterize the existing facilities' current technologies, EPA compiled facility-level, cooling system, and intake structure data for the 227 in-scope 316(b) Detailed Questionnaire (DQ) respondents and, to the extent possible, for the 316 in-scope 316(b) Short Technical Questionnaire (STQ) respondents. The Agency then used this tabulation of data to make determinations about costing decisions that hinged on the cooling systems and intake technologies in place. The result of the decision process assigned an intake technology module to each facility or intake that suited the particular site characteristics and would enable the facility to meet its compliance requirements. The Agency based its approach of assigning costing modules to model facilities on a combination of facility and intake-specific questionnaire data in addition to satellite photos and maps, where available. Because not all facilities received the same questionnaire, the Agency attempted to utilize data responses to questions that were asked in both the short-technical and detailed questionnaires whenever possible. In the end, the primary difference in data analysis between short-technical and detailed questionnaire respondents was the level at which the Agency developed costs. The short-technical questionnaire responses did not provide significant intake-level data, outside of intake identification information and velocity. The Agency treated short-technical questionnaire facilities as though they were a single intake with the characteristics reported for the facility. For the detailed questionnaire facilities, the Agency obtained sufficient intake-level information to develop individual costing decisions for each intake.

B1-1.1 Technology Costs

Existing facilities that do not currently comply with the Section 316(b) Phase II Existing Facilities Rule will have to implement technologies to reduce impingement mortality and/or entrainment. The specific technologies vary for the different

rule requirements and site-specific situations, but overall these technologies reduce impingement and entrainment (I&E) through implementing design and construction technologies.

For the final rule, each model facility has three potential compliance requirements: (1) no impingement and entrainment controls, (2) impingement controls only, or (3) impingement controls plus entrainment controls. A facility automatically qualifies for compliance requirement (1) if it has recirculating cooling systems in place.

The Agency determined the compliance requirement for each in-scope intake (facility) and compared that requirement against the type of technology already in-place. For the case of entrainment requirements, the intake technologies (outside of recirculating cooling) that qualify to meet the requirements at baseline are fine mesh screen systems, and combinations of far-offshore inlets with passive intakes or fish handling/return systems. A small subset of intakes has entrainment qualifying technologies in-place at baseline. Therefore, in the case of entrainment requirements, most facilities with the requirement will receive technology upgrades. For the case of impingement requirements, there are a variety of intake technologies that qualify to meet the requirements at baseline. The intake types meeting impingement requirements at baseline include the following: barrier net (the only fish diversion system which qualifies), passive intakes (of a variety of types), and fish handling and return systems. A significant number of intakes (facilities) have impingement technologies in place. Therefore, some intakes (facilities) require no technology upgrades when only impingement requirements apply.

For facilities that do not pre-qualify for impingement and/or entrainment technology in-place credits, the Agency analyzed questionnaire data relating to the intake type to determine the particular technology module that would best meet the requirements for the intake.

EPA developed the following costing modules for assessing model-facility compliance costs for today's final rule:

- #1 – Fish handling and return system (impingement only)
- #2 – Fine mesh traveling screens with fish handling and return (impingement & entrainment)
- #3 – New larger intake structure with fine mesh, handling and return (impingement & entrainment)
- #4 – Passive fine mesh screens with 1.75 mm mesh size at shoreline (impingement & entrainment)
- #5 – Fish barrier net (impingement only)
- #6 – Gunderboom (impingement & entrainment)
- #7 – Relocate intake to submerged offshore with passive fine mesh screen with 1.75 mm mesh size (impingement & entrainment)
- #8 – Velocity cap at inlet of offshore submerged (impingement only)
- #9 – Passive fine mesh screen with 1.75 mm mesh size at inlet of offshore submerged (impingement & entrainment)
- #10 – Shoreline tech for submerged offshore (impingement only or I&E)
- #11 – Double-entry, single-exit with fine mesh and fish handling and return (impingement & entrainment)
- #12 – Passive fine mesh screens with 0.75 mm mesh size at shoreline (impingement & entrainment)
- #13 – Relocate intake to submerged offshore with passive fine mesh screen with 0.75 mm mesh size (impingement & entrainment)
- #14 – Passive fine mesh screen at inlet of offshore submerged with 0.75 mm mesh size (impingement & entrainment)

The development and documentation accompanying these costing modules is available in the *Phase II Technical Development Document*.

B1-1.2 Energy Costs

Installation of some of the compliance technologies considered for the final rule will require a one-time, temporary downtime of the plant.

Table B1-1: Estimated Average Downtime for Technology Modules

Module #	Description	Estimated Net Downtime (Weeks)
1	Fish handling and return system	0
2	Fine mesh traveling screens with fish handling and return	0
3	New larger intake structure with fine mesh, handling and return	2 - 4
4	Passive fine mesh screens with 1.75 mm mesh size at shoreline	9 - 11
5	Fish barrier net	0
6	Gunderboom	0
7	Relocate intake to submerged offshore with passive fine mesh screen with 1.75 mm mesh size	9 - 11
8	Velocity cap at inlet of offshore submerged	0
9	Passive fine mesh screen with 1.75 mm mesh size at inlet of offshore submerged	0
10	Shoreline tech for submerged offshore	0
11	Double-entry, single-exit with fine mesh and fish handling and return	0
12	Passive fine mesh screens with 0.75 mm mesh size at shoreline	9 - 11
13	Relocate intake to submerged offshore with passive fine mesh screen with 0.75 mm mesh size	0
14	Passive fine mesh screen at inlet of offshore submerged with 0.75 mm mesh size	9 - 11

Source: U.S. EPA analysis, 2004.

The estimated downtimes are net outages attributable to the changes made to the cooling system in response to the final Phase II rule. EPA assumes that plants would minimize the disruption to their operations by making the required technology upgrades during times of scheduled maintenance outages. Scheduled maintenance outages can range from several weeks to several months, depending on the type of facility and the specific maintenance requirements.[1] Therefore, by scheduling the technology upgrades during maintenance periods, facilities could minimize the net impact of their system changes. For the purposes of this analysis, the Agency assumed that the typical scheduled maintenance outages would be four weeks.

❖ *Monetary valuation of downtime*

Technology upgrade downtimes represent a cost to the facilities that incur them. This cost is a loss in revenues offset by a simultaneous reduction in variable production costs (while the plant is out of service, it loses revenues but also does not incur variable costs of production).

EPA estimated facility-specific baseline revenue losses using 2008 revenue projections from the Integrated Planning Model (IPM®). IPM revenues consist of energy revenues and capacity revenues (see discussion of the IPM in Chapter B3). One-time losses due to installation downtime were calculated by dividing each facility's annual revenue projections by 52 and multiplying this value by the estimated average downtime (in weeks) of the facility's compliance technology. For facilities not modeled by the IPM, EPA calculated revenues based on electricity sales for a "typical" operating year for each in-scope facility (using public data from the Energy Information Administration) and the utility-specific wholesale price of electricity. For more detail on this substitute methodology, please refer to Chapter B2 of the EBA as published in support of the proposed Phase II rule.

EPA also used IPM estimates to calculate avoided variable production costs during the downtime, again using facility-specific 2008 projections from the IPM. Variable production cost include both fuel and other variable operating and maintenance costs. Similar to revenues, each facility's annual variable production costs were divided by 52 and multiplied by the facility's estimated average downtime (in weeks). For facilities not modeled by the IPM, EPA used average variable production cost per megawatt hour (MWh) by North American Electric Reliability Council (NERC) region and plant type, calculated from all

[1] For a detailed discussion of scheduled maintenance outages, see the *Phase II Technical Development Document.*

Phase II facilities modeled by the IPM, and multiplied the facility's generation by the average that corresponds to the facility's NERC region and plant type.[2]

In summary, the average cost of the technology upgrade downtime is the revenue loss during the downtime less the variable expenses that would normally be incurred during that period. The following formulas were used to calculate the net loss due to downtime:

$$\textit{Cost of Connection Outage} = \textit{Revenue Loss} - \textit{Variable Production Costs}$$

where

$$\textit{Variable Production Cost} = \textit{Fuel Cost} + \textit{Variable Operating} \wedge \textit{Maintenance Cost}$$

This approach may overstate the cost of the connection outage because it is based on average annual revenues and variable production costs. If downtime is scheduled during off-peak times, the loss in revenues could be smaller as a result of lower electricity sales and electricity prices.

B1-1.3 Administrative Costs

Compliance with the final Phase II rule requires facilities to carry out certain administrative functions. These are either one-time requirements (compilation of information for the initial post-promulgation NPDES permit) or recurring requirements (compilation of information for subsequent NPDES permit renewals; and monitoring, record keeping, and reporting). This section describes each of these administrative requirements and their estimated costs.

a. Initial post-promulgation National Pollution Discharge Elimination System (NPDES) permit application

The final rule requires existing facilities to submit information regarding the location, construction, design, and capacity of their existing or proposed cooling water intake structures, technologies, and operational measures, as part of their initial post-promulgation NPDES permit applications. Some of these activities would be required under the current case-by-case cooling water intake structure permitting procedures, regardless of the final Phase II rule, but are still included in EPA's compliance cost estimate; therefore, the permitting costs of this final rule may be overestimated. Activities and costs associated with the initial permit renewal application include:

- ***start-up activities:*** reading and understanding the rule; mobilizing and planning; and training staff;
- ***permit application activities:*** developing a statement of the compliance option selected; developing drawings that show the physical characteristics of the source water; developing a description of the cooling water intake structure (CWIS) configuration and location; developing a facility water balance diagram; developing a narrative of CWIS and cooling water system (CWS) operational characteristics; performing engineering calculations; submitting materials for review by the Director; and keeping records;

In addition, the initial permit renewal application requires a comprehensive demonstration study. The comprehensive demonstration study is a broad set of activities meant to: (1) characterize the source water baseline in the vicinity of the intake structure(s); (2) characterize operation of the cooling water intake(s); and (3) confirm that the technology(ies), operational measures and restoration measures proposed and/or implemented at the CWIS meet the applicable performance standards. The following activities are associated with the comprehensive demonstration study portion of the initial permit application:

- ***proposal for collection of information for comprehensive demonstration study:*** describing historical studies that will be used; describing the proposed and/or implemented technologies, operational measures, and restoration measures to be evaluated; developing a source water sampling plan; submitting data and plans for review; revising plans based on state review; and keeping records;

[2] For a detailed discussion of the NERC regions see Chapter B3, section B3-2.1.c.

- ***source waterbody flow information****:* gathering information to characterize flow (for freshwater rivers/streams); developing a description of the thermal stratification of the waterbody (for lakes/reservoirs); preparing supporting documentation and engineering calculations; submitting data for review; and keeping records;

- ***design and construction technology plan:*** delineating hydraulic zone of influence; developing narrative descriptions of technologies; performing engineering calculations; documenting that technologies are optimal; submitting the plan for review; and keeping records;
- ***impingement mortality and entrainment characterization study:*** performing biological sampling; performing impingement and entrainment monitoring; profiling source water biota; identifying critical species; developing a description of additional stresses; developing report based on study results; revising report based on state review; and keeping records;

- ***impingement mortality and entrainment characterization study capital and O&M costs:*** permitting process capital and O&M costs associated with the impingement mortality and entrainment characterization study;

- ***verification monitoring plan:*** developing a narrative description of the frequency of monitoring, parameters to be monitored, and the basis for determining the parameters and frequency and duration of monitoring; submitting data and plan for review; revising plan based on state review; and keeping records.

Table B1-2 below lists the estimated maximum costs of each of the initial post-promulgation NPDES permit application activities described above. The specific activities that a facility will have to undertake depend on the facility's source water body type and whether it exceeds capacity utilization rate and proportional flow thresholds. Certain activities are expected to be more costly for marine and Great Lakes facilities than for freshwater facilities. Some activities apply to all facilities, while other activities apply only if the facility exceeds the capacity utilization rate or proportional flow thresholds. Facilities that have recirculating systems in the baseline, and facilities that already have or are required to install wedgewire screens, will only have a few required activities. The maximum initial permitting cost for a facility that carries out all of the described activities is estimated to be approximately $1.0 million.

Table B1-2: Cost of Initial Post-Promulgation NPDES Permit Application Activities ($2002)

Activity	Estimated Maximum Cost per Permit				
	Freshwater River/ Stream	Lake	Great Lake	Estuary/ Tidal River	Ocean
Start-up activities[b]	$2,297	$2,297	$2,297	$2,297	$2,297
Permit application activities[a]	$11,105	$11,105	$11,105	$11,105	$11,105
Proposal for collection of information for comprehensive demonstration study[b]	$13,740	$13,740	$13,740	$13,740	$13,740
Source waterbody flow information[a]	$3,768	$4,370	$0	$0	$0
Design and construction technology plan[a]	$6,751	$4,875	$6,751	$6,751	$6,751
Impingement mortality and entrainment characterization study[c]	$442,474	$442,474	$811,401	$811,401	$811,401
Impingement mortality and entrainment characterization study capital and O&M costs[c]	$78,000	$78,000	$152,100	$152,100	$152,100
Verification monitoring plan[a]	$6,667	$6,667	$6,667	$6,667	$6,667
Total Initial Post-Promulgation NPDES Permit Application Cost	**$564,802**	**$563,528**	**$1,004,061**	**$1,004,061**	**$1,004,061**

[a] The costs for these activities are incurred during the year prior to the permit application.
[b] The costs for these activities are incurred during one year, three years prior to the permit application.
[c] The costs for these activities are incurred during the three years prior to the permit application.

Source: U.S. EPA, 2004a.

Another potential cost associated with the initial NPDES permit is pilot studies of compliance technologies. Facilities carry out pilot studies to determine if the compliance technology will function properly when installed and operated. EPA assumes that facilities with technology installation costs of greater than $500,000 will conduct pilot studies, and that these studies will cost either $150,000 or ten percent of technology installation costs, whichever is greater. EPA estimates that approximately 15 percent of Phase II facilities will incur these costs. Activities associated with pilot studies include:

- ***deploying the pilot technology:*** installing an intake pipe separate from the facility's actual cooling water system, but in the vicinity of the operating CWIS; installing the proposed technology to feed into the separate intake pipe; and pumping water through the intake pipe under various pumping scenarios and seasonal conditions;

- ***monitoring efforts:*** collecting five samples over a twenty-four hour period, every two weeks for six months;

- ***evaluation of data:*** analyzing the data; summarizing the results; and using this information to evaluate the effectiveness of the technology.

In addition to the activities described above, some facilities are expected to conduct a site-specific determination of Best Technology Available (BTA). Since activities associated with site-specific determinations are voluntary and would only be conducted if the facilities expected them to be less expensive than complying with the Phase II requirements, EPA did not include site-specific determination costs in its compliance cost estimates. The initial permitting activities associated with site-specific determinations are:

- ***information to support site-specific determination of BTA:*** performing a comprehensive cost evaluation study; developing valuation of monetized benefits of reducing impingement and entrainment; evaluating detailed mortality data; performing engineering calculations and drawings; submitting results for review; and keeping records; and

- ***site-specific technology plan:*** describing selected technologies, operational measures, and restoration measures; documenting that technologies, operational measures, or restoration measures are optimal; performing design calculations and preparing drawings and estimates; performing engineering calculations, including estimates of the efficacy of the proposed and/or implemented technologies, operational measures, or restauration measures; submitting results for review; and keeping records.

b. Subsequent NPDES permit renewals

Each existing facility will have to apply for NPDES permit renewal every five years. Subsequent permit renewal applications will require collecting and submitting the same type of information required for the initial permit renewal application. EPA expects that facilities can use some of the information from the initial permit application. Building upon existing information is expected to require less effort than developing the data the first time, especially in situations where conditions have not changed.

Table B1-3 lists the maximum estimated costs of each of the NPDES repermit application activities. The specific activities that a facility will have to undertake depend on the facility's source water body type and whether it exceeds the capacity utilization rate and proportional flow thresholds. Certain activities are expected to be more costly for facilities located on a Great Lake, estuary, tidal river, or ocean than for freshwater facilities. The maximum repermitting cost for a facility that carries out all of the described activities is estimated to be approximately $340,900.

Table B1-3: Cost of NPDES Repermit Application Activities ($2002)[a]

Activity	Estimated Maximum Cost per Permit				
	Freshwater River/ Stream	Lake	Great Lake	Estuary/ Tidal River	Ocean
Start-up activities	$770	$770	$770	$770	$770
Permit application activities	$6,875	$6,875	$6,875	$6,875	$6,875
Proposal for collection of information for comprehensive demonstration study	$3,816	$3,816	$3,816	$3,816	$3,816
Source waterbody flow information	$1,170	$1,351	$0	$0	$0
Design and construction technology plan	$3,459	$2,483	$3,459	$3,459	$3,459
Impingement mortality and entrainment characterization study	$143,613	$143,613	$265,147	$265,147	$265,147
Impingement mortality and entrainment characterization study capital and O&M costs	$31,200	$31,200	$60,840	$60,840	$60,840
Total NPDES Repermit Application Cost	**$190,904**	**$190,108**	**$340,907**	**$340,907**	**$340,907**

[a] The costs for these activities are incurred in the year prior to the application for a permit renewal.

Source: U.S. EPA, 2004a.

c. Monitoring, record keeping, and reporting

Monitoring, record keeping, and reporting activities and costs include:

- ***biological monitoring for impingement:*** collecting monthly samples for at least two years after the initial permit issuance; analyzing samples; performing statistical analyses; and keeping records;
- ***biological monitoring for entrainment:*** collecting biweekly samples during the primary period of reproduction, larval recruitment, and peak abundance for at least two years after the initial permit issuance; handling and preparing samples; performing statistical analyses, and keeping records;
- ***entrainment sampling capital and O&M costs:*** contract laboratory analysis of entrainment samples;
- ***verification study:*** conducting technology performance monitoring; performing statistical analyses; submitting monitoring results and study analysis; and keeping records;
- ***yearly status report activities:*** reporting on inspection and maintenance activities; detailing biological monitoring results; compiling and submitting the report; and keeping records.

Table B1-4 lists the estimated costs of each of the monitoring, record keeping, and reporting activities described above. Certain activities are expected to be more costly for marine facilities than for freshwater facilities. The maximum cost a facility are estimated to incur for its monitoring, record keeping, and reporting activities is approximately $99,900.

Table B1-4: Cost of Annual Monitoring, Record Keeping, and Reporting Activities ($2002)

Activity	Estimated Cost				
	Freshwater River/ Stream	Lake	Great Lake	Estuary/ Tidal River	Ocean
Biological monitoring for impingement	$19,227	$19,227	$24,487	$24,487	$24,487
Biological monitoring for entrainment	$31,724	$31,724	$39,667	$39,667	$39,667
Entrainment sampling capital and O&M costs	$7,800	$7,800	$10,140	$10,140	$10,140
Verification study	$7,457	$7,457	$7,457	$7,457	$7,457
Yearly status report activities	$18,152	$18,152	$18,152	$18,152	$18,152
Total Monitoring, Record Keeping, and Reporting Cost	**$84,361**	**$84,361**	**$99,904**	**$99,904**	**$99,904**

Source: U.S. EPA, 2004a.

B1-2 Assigning Compliance Years to Facilities

This section discusses the methodology used to estimate the compliance years of facilities subject to Phase II regulations. The estimated compliance years of facilities are important for two reasons: (1) they determine by how much compliance costs are discounted in the national cost estimate and (2) a high concentration of facilities estimated to be out of service as a result of technology upgrade downtimes in the same region and at the same time could lead to temporary energy effects in that region.

For this analysis, it was assumed that facilities have to come into compliance with the final Phase II rule during the year their first post-promulgation NPDES permit is issued. Since NPDES permits are renewed every five years, all facilities are estimated to come into compliance between 2005 and 2009.[3] Table B1-5 presents the distribution of Phase II facilities by North American Electric Reliability Council (NERC) region and compliance year. The NERC regions presented in the table are:

- ASCC – Alaska
- ECAR – East Central Area Reliability Coordination Agreement
- ERCOT – Electric Reliability Council of Texas
- FRCC – Florida Reliability Coordinating Council
- HI – Hawaii
- MAAC – Mid-Atlantic Area Council
- MAIN – Mid-America Interconnect Network
- MAPP – Mid-Continent Area Power Pool
- NPCC – Northeast Power Coordinating Council
- SERC – Southeastern Electric Reliability Council
- SPP - Southwest Power Pool
- WSCC – Western Systems Coordinating Council

[3] Note that this assumption was made for this analysis only. EPA estimates that, in reality, compliance will begin in 2008.

Table B1-5: Weighted Number of Phase II Facilities by NERC Region and Compliance Year[a]

NERC Region	2005	2006	2007	2008	2009	Total
ASCC	1	0	0	0	0	**1**
ECAR	16	23	29	22	12	**102**
ERCOT	11	7	4	14	15	**51**
FRCC	10	3	1	8	8	**30**
HI	0	0	0	0	3	**3**
MAAC	11	11	11	8	4	**45**
MAIN	15	13	7	8	10	**53**
MAPP	7	7	11	15	4	**44**
NPCC	15	15	11	12	8	**61**
SERC	16	20	25	20	15	**96**
SPP	10	5	4	8	5	**32**
WSCC	14	7	4	3	6	**35**
Total	**126**	**111**	**107**	**119**	**91**	**554**

[a] Note that compliance years were estimated for this analysis. Actual compliance years might be different than stated in this table.

Source: U.S. EPA analysis, 2004.

B1-3 Total Private Compliance Costs

EPA estimated the total private pre-tax compliance costs for the final Phase II rule and the alternative regulatory options based on the unit costs discussed in Section B1-1 and the compliance years discussed in Section B1-2. Technology compliance costs were developed in July 2001 dollars and converted to year-2002 dollars using the construction cost index (CCI). Administrative costs were developed in 2002 dollars.

B1-3.1 Methodology

The private cost of the Phase II rule represents the total compliance costs of the 554 in-scope section 316(b) Phase II facilities. For this analysis, EPA assumed that facilities will comply over a five-year period between 2005 and 2009. EPA estimated the total private cost of the rule by calculating the present value of each facility's one-time costs as of 2004. To derive the constant annual value of the one-time costs, EPA annualized the costs of each compliance technology over its expected useful life, using a seven percent discount rate. EPA then added the annualized one-time costs to the annual costs to derive each facility's total annual cost of complying with the Phase II rule. EPA estimated the post-tax value of private compliance costs by applying Federal and State corporate income tax rates to privately-owned facilities (U.S. Department of the Treasury, 2002; FTA, 2003). Government-owned entities and cooperatives are not subject to income taxes.

a. Present value of compliance costs

EPA calculated the present value of the one-time capital, downtime, and initial permit costs using a seven percent discount rate. The following assumptions were made regarding the timing of these one-time costs:

- ***Capital Costs:*** This cost is incurred in the year that the facility's first post-promulgation permit is issued.
- ***Cost of Connection Outage:*** EPA estimates that the average outage to construct and install the various compliance technologies ranges from zero to 11 weeks. A more detailed description of this cost is presented in Section B1-1.2 above. This cost is incurred in the year that the facility installs the technology.

- ***Impingement Mortality and Entrainment Characterization Study:*** This is a three-year study required for all facilities except those who already have recirculating systems in the baseline and those who already have or are installing a wedgewire screen. The cost of this study is incurred over the three years preceding the facility's first post-promulgation permit.

The following formula was used to calculate the net present value of the one-time costs as of 2004:[4]

$$Present\ Value_x = \frac{Cost_{x,t}}{(1 + r)^{t - 2004}}$$

where:

$Cost_{x,t}$	=	Costs in category x and year t
x	=	Cost category
r	=	Discount rate (7% in this analysis)
t	=	Year in which cost is incurred (2005 to 2009)

b. Annualization of compliance costs

Annualized compliance costs include all capital costs, O&M costs, administrative costs, and plant outage costs of compliance with the final Phase II rule. To derive the constant annual value of the capital costs and the value of the technology construction and/or connection plant downtime, EPA annualized them over the component's useful life, using a seven percent discount rate. Capital costs, which include fine-mesh traveling screens with and without fish handling as well as fish handling and return systems, were annualized over 10 years; the connection downtime and initial permitting costs were annualized over 30 years; the repermitting costs were annualized over 5 years. EPA calculated the annualized capital costs using the following formula:

$$Annualized\ Capital\ Cost = Total\ Capital\ Costs \times \frac{r \times (1 + r)^n}{(1 + r)^n - 1}$$

where:

r	=	Discount rate (7% in this analysis)
n	=	Amortization period (useful life of equipment; 30 years for connection downtime and initial permitting costs; 10 years for flow reduction and I&E technologies; 5 years for repermitting costs)

EPA then added the annualized capital, downtime, and permitting costs to annual O&M and administrative costs to derive each facility's total annual cost of complying with the final Phase II rule.

c. Consideration of taxes

Compliance costs associated with the section 316(b) regulation reduce the income of facilities subject to the rule. As a result, the tax liability of these facilities decreases. The net cost of the rule to facilities is therefore the compliance costs of the rule less the tax savings that result from these compliance costs. EPA estimated the tax savings by developing a total tax rate that integrates the federal corporate income tax rate (35 percent) and state-specific state corporate income tax rates. The total effective tax rate was calculated as follows:

$$Total\ Tax\ Rate = State\ Tax\ Rate + Federal\ Tax\ Rate - (State\ Tax\ Rate * Federal\ Tax\ Rate)$$

[4] Calculation of the present value assumes that the cost is incurred at the beginning of the year.

The amount by which a facility's annual tax liability would be reduced is the annualized compliance cost of the rule multiplied by the total tax rate.[5] A reduction in tax liability was only applied to privately-owned facilities (government-owned entities and cooperatives are not subject to income taxes).

B1-3.2 Total Private Costs of the Final Rule

EPA estimates that the 554 in-scope facilities will incur annual costs of complying with the final Phase II rule of $385 million on a pre-tax basis and $250 million on a post-tax basis. Table B1-6 presents annualized facility compliance costs by cost category and steam plant type. Costs are presented on a pre-tax and post-tax basis. The annual pre-tax compliance costs range from approximately $6.6 million for other steam facilities to $185 million for coal steam facilities. The annual post-tax compliance costs range from approximately $4.0 million for other steam facilities to $122 million for coal steam facilities.

Table B1-6: Private Annualized Compliance Costs by Plant Type (in millions, $2002)

Plant Type	One-Time Costs				Recurring Costs			Total
	Capital Technology	Connection Outage	Initial Permit Application	Pilot Study	O&M	Monitoring, Record Keeping & Reporting	Permit Renewal	
Pre-Tax Compliance Costs								
Coal Steam	$87.2	$26.3	$12.7	$1.1	$24.3	$24.2	$8.9	**$184.7**
Combined Cycle	$5.5	$0.3	$0.7	$0.1	$0.6	$1.4	$0.5	**$9.0**
Nuclear	$57.1	$21.4	$2.3	$1.1	$2.9	$4.9	$1.7	**$91.4**
O/G Steam	$43.5	$3.8	$9.1	$0.8	$15.5	$14.2	$6.5	**$93.4**
Other Steam	$3.0	$0.5	$0.6	$0.1	$1.2	$0.7	$0.4	**$6.6**
Total	**$196.2**	**$52.3**	**$25.4**	**$3.2**	**$44.4**	**$45.6**	**$18.2**	**$385.1**
Post-Tax Compliance Costs								
Coal Steam	$56.4	$17.0	$8.6	$0.7	$16.6	$16.5	$6.1	**$122.1**
Combined Cycle	$3.4	$0.2	$0.5	$0.0	$0.4	$1.0	$0.4	**$5.8**
Nuclear	$34.9	$12.8	$1.5	$0.7	$2.1	$3.1	$1.1	**$56.2**
O/G Steam	$27.9	$2.3	$6.1	$0.5	$10.8	$9.6	$4.3	**$61.5**
Other Steam	$1.8	$0.3	$0.4	$0.1	$0.7	$0.4	$0.3	**$4.0**
Total	**$124.5**	**$32.6**	**$17.0**	**$2.0**	**$30.6**	**$30.7**	**$12.2**	**$249.5**

Source: U.S. EPA analysis, 2004.

B1-4 Uncertainties and Limitations

EPA's estimates of the compliance costs associated with the final Section 316(b) Existing Facilities Rule are subject to limitations because of uncertainties about the number and characteristics of the existing facilities that will be subject to the rule. Projecting the number of existing facilities that meet the design intake flow threshold is subject to uncertainties associated with the quality of data reported by the facilities in their Detailed Questionnaire (DQ) and Short Technical Questionnaire (STQ) surveys, and with the accuracy of the design flow estimates for the STQ facilities. Characterizing the cooling systems and intake technologies in use at existing facilities is also subject to uncertainties associated with the quality

[5] This calculation is a conservative approximation of the actual tax effect of the compliance costs. For capital costs, it assumes that the total annualized cost, which includes imputed interest and principal charge components, is subject to a tax benefit. In effect, the schedule of principal charges *over time* in the annualized cost value is treated, for tax purposes, as though it were the depreciation schedule *over time*. In fact, the actual tax depreciation schedule that would be available to a company would be accelerated in comparison to the principal charge schedule embedded in the annualized cost calculation. As a result, explicit accounting for the deprecation schedule would yield a slightly higher present value of tax benefits than is reflected in the analysis presented here.

of data reported by the facilities in their surveys and with the projected technologies for the STQ facilities. The estimated national facility compliance costs may be over- or understated if the projected number of Phase II existing facilities is incorrect or if the characteristics of the Phase II existing facilities are different from those assumed in the analysis.

There is additional uncertainty about the valuation of the connection outage. EPA's analysis used projected future information on electricity generation, electricity prices, and variable production costs, which may not be representative of conditions at the time when facilities comply with Phase II regulation.

Limitations in EPA's ability to consider a full range of compliance responses may result in an overestimate of facility compliance costs. The Agency was not able to consider certain compliance responses, including the costs of using alternative sources of cooling water, the costs of some methods of changing the cooling system design, and the costs of restoration. Costs will be overstated if these excluded compliance responses are less expensive than the projected compliance response for some facilities.

Alternative less stringent requirements based on both costs and benefits are allowed under the final rule. There is some uncertainty in predicting compliance responses because the number of facilities requesting alternative less stringent requirements based on costs and benefits is unknown.

REFERENCES

Federation of Tax Administrators (FTA). 2003. *Range of State Corporate Income Tax Rates* (for tax year 2003). http://www.taxadmin.org/fta/rate/corp_inc.html, accessed July 17, 2003.

U.S. Department of the Treasury. 2002. Internal Revenue Service (IRS). *2002 Instructions for Forms 1120 & 1120-A, page 17* (Federal tax rates).

U.S. Environmental Protection Agency (U.S. EPA). 2004a. *Information Collection Request for Cooling Water Intake Structures, Phase II Existing Facility Final Rule.* ICR Number 2060.02. February 2004.

U.S. Environmental Protection Agency (U.S. EPA). 2004b. *Technical Development Document for the Final Section 316(b) Phase II Existing Facilities Rule*. EPA-821-R-04-007. February 2004.

THIS PAGE INTENTIONALLY LEFT BLANK